ANNUAL REPORT 1965

FRANKFORD

- water pollution control plant
- water supply system

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Frankford Local Advisory Committee,
Village of Frankford.

Gentlemen:

I am pleased to provide you with the 1965 Annual Report for the Frankford Water Pollution Control Plant and Water Supply System, OWRC Project Nos. 57-S-9 and 57-W-2.

We appreciate the co-operation you have extended to our Operations staff throughout the year, and trust that continuation of this close association will ensure even greater progress in the sphere of water pollution control.

Yours very truly,

D. S. Caverly,
General Manager.

ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET

TORONTO 5

J. A. VANCE, LL.D.
CHAIRMAN

J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir;

I am pleased to provide you with the 1965 Annual Report on the operation of the Frankford Water Pollution Control Plant and Water Supply System, OWRC Project Nos. 57-S-9 and 57-W-2.

The report presents design data, outlines operating problems encountered during the year and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report provides useful information on the operating efficiency of this project during 1965. It is intended to act as a guide in gauging plant performance. To implement that aim, it includes detailed statistical and cost data, a description of the project and a summary of its operation during the year.

Of particular interest will be the cost data, which show the total cost to the municipality and the areas of major expenditure.

The Regional Operations Engineer is primarily responsible for the preparation of the report, and has compiled and arranged the material. He will be pleased to answer any questions regarding it. Other groups, however, were involved in the production, and these include the statistics section, the Drafting Section of the Division of Sanitary Engineering and the Division of Finance.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

CONTENTS

FRANKFORD

water pollution control plant
and
water supply system

operated for

THE VILLAGE OF FRANKFORD

by the

ONTARIO WATER RESOURCES COMMISSION

CHAIRMAN: Dr. James A. Vance

VICE-CHAIRMAN: J. H. H. Root, M.P.P.

COMMISSIONERS

W. D. Conklin
D. A. Moodie
H. E. Brown
L. E. Venchiarutti

GENERAL MANAGER: D. S. Caverly

ASSISTANT GENERAL MANAGERS

L. E. Owers
F. A. Voege
K. H. Sharpe
A. K. Watt

COMMISSION SECRETARY

W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: D. A. McTavish
Operations Engineer: J. N. Dick

801 Bay Street Toronto 5

'65 REVIEW

SEWAGE SYSTEM

The total operating cost for the year 1965 was $4,920.71 with payroll accounting for the highest proportion of the cost at $3,215.81.

Raw sewage directed to the plant averaged 157 ppm BOD and 160 ppm SS. The efficiency of BOD and SS removal was acceptable at 75.5% and 80.5% respectively for primary and trickling filter treatment.

A prefabricated metal building was erected at the plant this year for the storage of plant materials and equipment.

WATER SYSTEM

The total operating costs were $2,065.84 or $67.75 per million gallons of water used by the Village. Payroll again accounted for the largest portion of the cost at $1,056.78. Power and Sundry costs were next at $571.99 and $378.75 respectively.

The painting of the standpipe in June took approximately three weeks and during this period the pump operated continuously without any difficulty.

No treatment is given to the water as the aquifer from which the water is pumped is of a high quality.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
BTU	British Thermal Unit
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	linear feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
pH	a symbol for hydrogen-ion concentration; a pH test determines the intensity of the acidity or alkalinity of a water
ppm	parts per million
ss	suspended solids
SWD	side wall depth
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)
turbidity	a measurement of the amount of visible material in suspension in water

HISTORY
1957 - 1965

INCEPTION

The water works pumping station was built under OWRC approval No. 57-13-480 and the water pollution control plant was built under OWRC approval No. 57-S-596. Both plants are operated by the Ontario Water Resources Commission under agreements with the municipality.

CONSTRUCTION

Graham, Reid & Associates Ltd., was the Consulting Engineer for the project and was responsible for the design and supervision of construction. Construction of both plants was completed in 1957.

TOTAL COST: 57-W-2 $119,401.83
57-S-9 $162,062.20

Project Staff

COMMENTS

Harry A. Patrick has been the OWRC operator for the projects since their completion in 1957.

Frequent inspection of the Frankford treatment systems by head office engineers and technicians have found the plants well maintained and operated.

Description of Project

WATER POLLUTION CONTROL PLANT

DESIGN FLOW

The plant was designed for a population of 2700 persons and a per capita flow of 200 gallons per day. Primary treatment can be given to the total design flow. However, secondary treatment can only be given to 120,000 gallons per day. The present population of the village is approximately 1650.

INLET SEWERS

Sewage flows by gravity to the treatment plant by means of a 12-inch diameter collection sewer.

RAW SEWAGE WELL

A raw sewage well, 15.5 feet by 3 feet by 7.5 feet deep with a capacity of 870 gallons provides suctions for the lift pumps. No screen or other protection is provided for these pumps.

RAW SEWAGE PUMPS

The following low lift raw sewage pumps are provided at the plant:

One Smart-Turner vertical centrifugal pump rated at 375 gallons per minute at a head of 20 feet and driven by a 5 hp Robbins and Myers electric motor.

One Smart-Turner vertical centrifugal pump rated at 375 gallons per minute at a head of 20 feet and driven by a Wisconsin air-cooled gasoline engine. This unit is employed for standby purposes.

The pumps are equipped with automatic float activated controls.

BAR SCREEN

Two stationary, manually cleaned coarse bar screens, with 1 1/2-inch by 1/2-inch bars at 1-inch centres and inclined at 60 degrees to the horizontal are provided. One is located at the entrance to each of the two grit channels.

GRIT REMOVAL

Two grit channels, each 9 feet by 2 feet by 2.5 feet deep (1 foot deep liquid level) are provided for grit removal purposes. At the design flow of 540,000 gallons per day, the velocity in the grit channels, with both channels in use, is 0.25 feet per second, and the retention period is 36 seconds.

A division box, 4.5 feet by 2 feet by 2.5 feet deep is provided at both ends of the grit channels.

Wooden shear gates are provided at both ends of each grit channel.

PRIMARY SEDIMENTATION TANK

From the grit channels, the sewage flows by gravity to an 80 feet by 16.5 feet by 8 feet deep (7.5 feet SWD) primary sedimentation tank. The tank provides a capacity of 48,300 gallons and a retention period of 2.06 hours at a flow of 540,000

gallons per day. At this rate of flow the surface settling rate is 546 gallons per square foot of tank surface area per day and the overflow rate is 32,700 gallons per foot of weir length per day.

The sedimentation tank is equipped with a longitudinal sludge collection and skimming mechanism.

BIOLOGICAL FILTER

A biological filter, 42 feet in diameter with a store depth of 4 feet, provides a rate of filtration of 390 gallons per day per square foot of filter surface area at a recirculation ratio of 3 to 1. The BOD load in the filter was designed as 127 pounds of BOD per day per 1000 cubic feet of filter volume.

The filter is underdrained by 8-inch diameter tiles at 2 foot centres and draining to two 10-inch diameter collector pipes which drain to a manhole from which the flow can be returned to the raw sewage well, or directly to the final settling tank.

SECONDARY SETTLING TANK AND CHLORINE CONTACT CHAMBER

An earth-banked pond, 40 feet by 16 feet deep, provides a capacity of 12,000 gallons and a retention period of 214 hours at a flow of 120,000 gallons per day. The chlorine is introduced at the entrance to this pond for disinfection purposes. Wooden baffles are provided at the entrance to and exit from the tank to limit short circuiting.

No mechanical sludge removal facilities are provided in this pond.

CHLORINATOR

A Wallace and Tiernan Variable-Orifice V-notch gas chlorinator (Series A-741) is provided at the plant. The operation of the chlorinator is manual with the orifice in use permitting dosages of from 0 to 50 pounds per 24 hours.

A weigh scale is provided for use in conjunction with this equipment.

SLUDGE REMOVAL

Three times a week sludge is removed by truck from the primary settling tank and dumped in some field. The sludge drying beds provided are not in use because of the bad odours they give off.

SLUDGE PUMPING EQUIPMENT

A Carter plunger-type pump, rated at 50 gallons per minute at a head of 30 feet and driven by a 2 hp Link-Belt electric motor, is employed to pump settled sludge and skimmings from the primary sedimentation tank to the sludge haulage truck.

INSTRUMENTATION

A Standard recording and totalizing devise is provided at the plant. The unit is activated by the operation of the raw sewage pumps and records the period of pumping.

WATER SUPPLY SYSTEM

GENERAL

Ground water is used as the source of supply. The well is located in the pumphouse and reportedly is 32 feet deep with a 15-inch steel casing extending for approximately 10 feet. The static level of this well is 12 feet and the pumping level, 13 feet. There is no treatment afforded the water and storage is provided by means of a 115,000 gallon steel standpipe.

These are approximately 225 services and 11 hydrants on the system. The water is metered at the plant with an average consumption of approximately 40,000 gallons per day.

PUMPING EQUIPMENT

A Layne vertical turbine type deep well pump rated at 300 gallons per minute and driven by a 25 horsepower U.S. electric motor is employed to pump the water from the well to the standpipe

No auxiliary power supply is available in the event of an electric power failure.

INSTRUMENTATION

A Sparling meter (Model 41U37) is provided on the discharge side of the pump to record daily plant flows.

A Morrison Brass gauge with a range of 0 to 100 pounds per square inch is supplied to operate in conjunction with automatic controls for the operation of the pump. The pump is set to begin at 48 psi and cease at approximately 55 psi.

Technical Section

PROJECT COSTS

57-S-9

NET CAPITAL COST	$162,062.20
DEDUCT - Payments from Municipalities	4,899.45
Long Term Debt to OWRC	$157,162.75
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$ 18,093.92
Net Operating	$ 4,920.71
Debt Retirement	3,172.00
Reserve	832.11
Interest Charged	8,817.90
TOTAL	$ 17,742.72

RESERVE ACCOUNT

Balance at January 1, 1965	$ 4,429.51
Deposited by Municipality	832.11
Interest Earned	254.45
	$ 5,516.07
Less Expenditures	(577.72)
Balance at December 31, 1965	$ 4,938.35

MONTHLY OPERATING COSTS

57-S-9

MONTH	TOTAL EXPENDITURE	PAYROLL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	237.29	227.92						9.37
FEB	280.66	220.14	39.87					20.65
MARCH	426.30	271.55	43.93		15.09		7.21	88.52
APRIL	345.64	266.49	38.05		13.43			27.67
MAY	483.83	360.56	39.89		21.55			61.83
JUNE	372.33	238.50	29.29		70.30	4.07		30.17
JULY	485.55	238.50	28.93		26.75			191.37
AUG	568.32	238.50	29.32	224.03		51.50		24.97
SEPT	323.43	246.90	28.42		10.94			37.17
OCT	504.20	370.35	31.72		13.16		59.15	29.82
NOV	462.80	283.70	36.65				93.76	48.69
DEC	430.36	252.70	76.10		26.09	12.00	20.55	42.92
TOTAL	4920.71	3215.81	422.17	224.03	197.31	67.57	180.67	613.15

PROJECT COSTS

57-W-2

NET CAPITAL COST (Final) Long Term Debt to OWRC	$119,401.83
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1965	$ 13,287.37
Net Operating	$ 2,065.84
Debt Retirement	2,410.00
Reserve	533.67
Interest Charged	6,699.34
TOTAL	$ 11,708.85

RESERVE ACCOUNT

Balance at January 1, 1965	$ 5,273.42
Deposited by Municipality	533.67
Interest Earned	276.19
	$ 6,083.28
Less Expenditures	(1,901.00)
Balance at December 31, 1965	$ 4,182.28

MONTHLY OPERATING COSTS

57-W-2

MONTH	TOTAL EXPENDITURE	PAYROLL	POWER	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	75.98	75.98					
FEB	138.24	73.38	53.03	2.00			9.83
MARCH	235.91	90.52	56.47				88.92
APRIL	138.09	87.85	50.24				
MAY	169.41	120.18	49.23				
JUNE	123.78	79.50	44.28				
JULY	2311.22	79.50	50.72			1901.00	280.00
AUG	176.90	79.50	41.06		56.34		
SEPT	124.47	82.30	42.17				
OCT	(1739.25)	123.45	38.30			(1901.00)	
NOV	132.12	85.10	47.02				
DEC	178.97	79.50	99.47				
TOTAL	2065.84	1056.76	571.99	2.00	56.34		378.75

BRACKETS INDICATE CREDIT

YEARLY OPERATING COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER THOUSAND GALLONS
1965	30,495	$ 2,065.84	* $ 4.76	$ 0.07

* BASED ON ESTIMATED ANNUAL POPULATION AND 3.9 PERSONS PER FAMILY

Design-Data

SEWAGE

The sewage is collected in a system of sewers and brought to a collecting well at the sewage treatment plant.

Type of Plant - High rate trickling filter

Design Population - 2700 ultimately

Per Capita Flow - 200 gallons per day (3 DWF)

Design Plant Flow - Primary: 540,000 gpd.
- Secondary: 120,000 gpd.

RAW SEWAGE PUMPING STATION

2 pumps - 1 electric, 1 cfs @ 20' head = 540,000 gpd.
- 1 gasoline standby

Wet Well - 16' x 3' x 3'
- capacity 550 gallons (with tapered sump) float control to pumps.

SCREENING

Coarse bar screen - 1/2" x 1 1/2" bars @ 1" crs.

GRIT REMOVAL

2 units 2' x 9' x 12" water depth @ 1 cfs - velocity 0.5 ft./sec.

Settling Tank - mechanically cleaned

16' 6" x 60' x 7' 5" water depth

Volume - 7455 cu. ft. or 46,500 gallons
Retention period @ 1 cfs - 2 hrs.

Surface settling rate - 565 gal/sq. ft. tank per day.

Overflow rate - 33,800 gals/lin. ft. weir per day.

Trickling Filter - design flow 120,000 gpd

42 ft. dia. 4 ft. deep
Media pass 5" retained on 3" screen
Recirculation 3.1 back through primary tank.
1.5 lbs. BOD/cu. yd. media/day.

Final Settling Tank

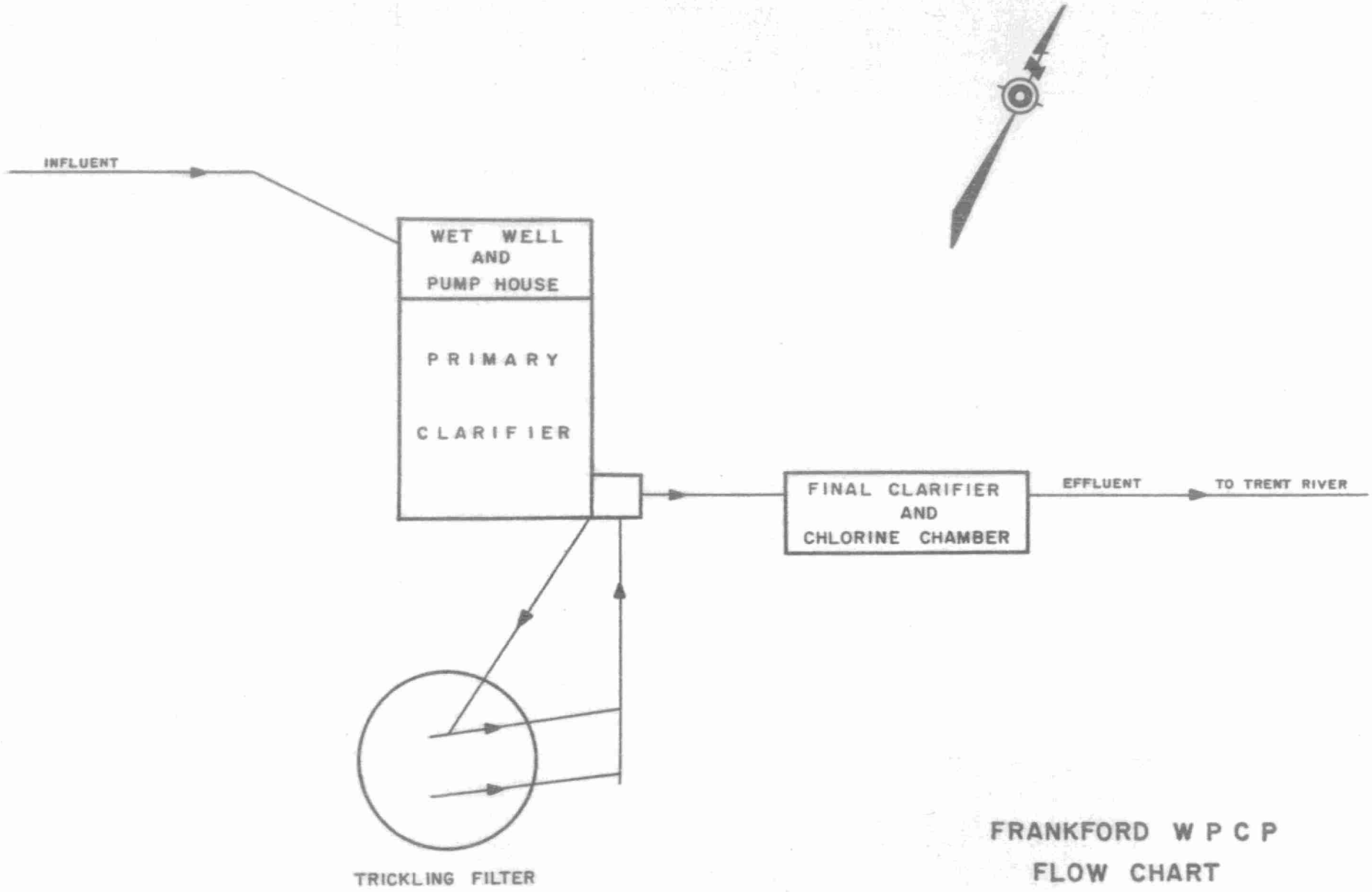
Earth banked pond 16' x 40' x 3' deep
Retention - 2 hours
also used as chlorine contact chamber.

WATER

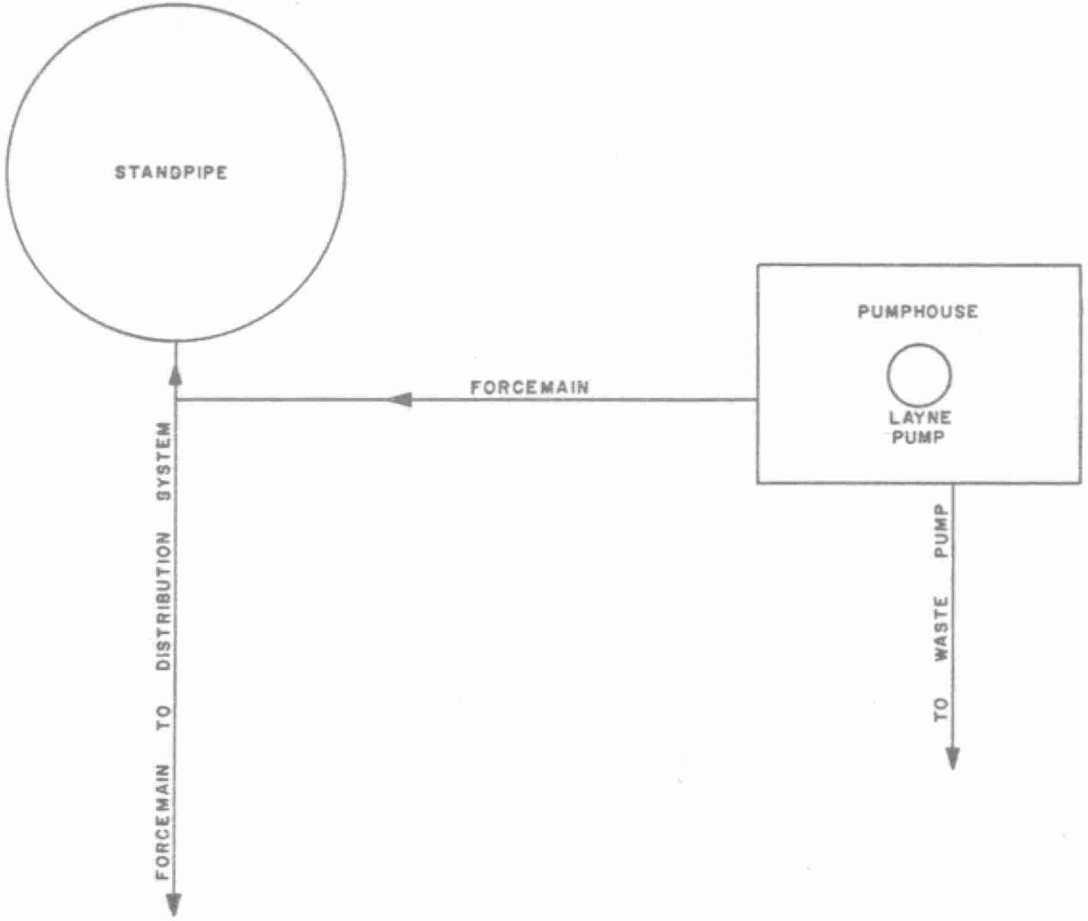
Pumping Station and Well.

Pump capacity ---------- 300 IGPM

Distribution System --- 115,000 gallon standpipe reservoir, water mains, hydrants, valves and appurtenances.



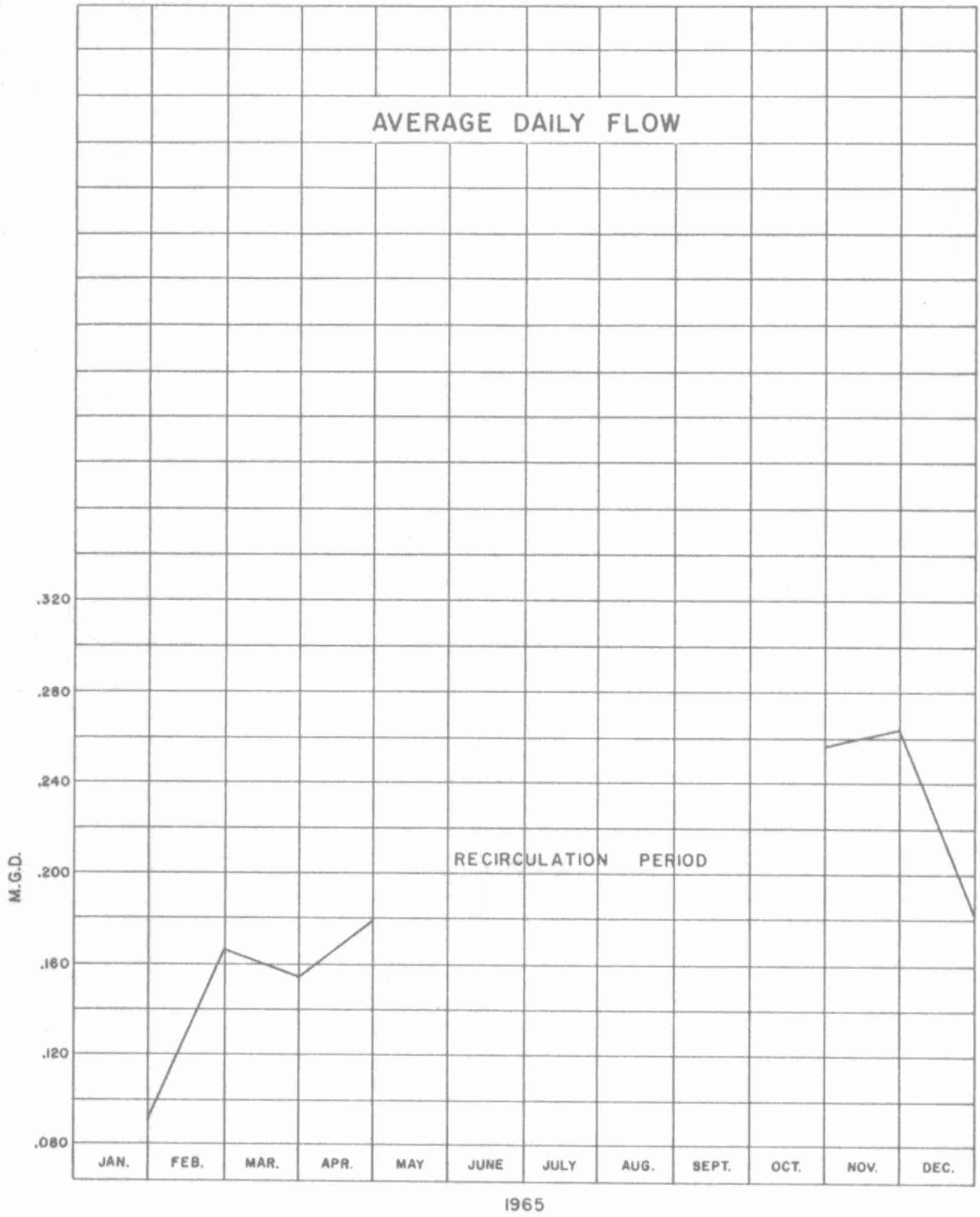
FRANKFORD W P C P
FLOW CHART

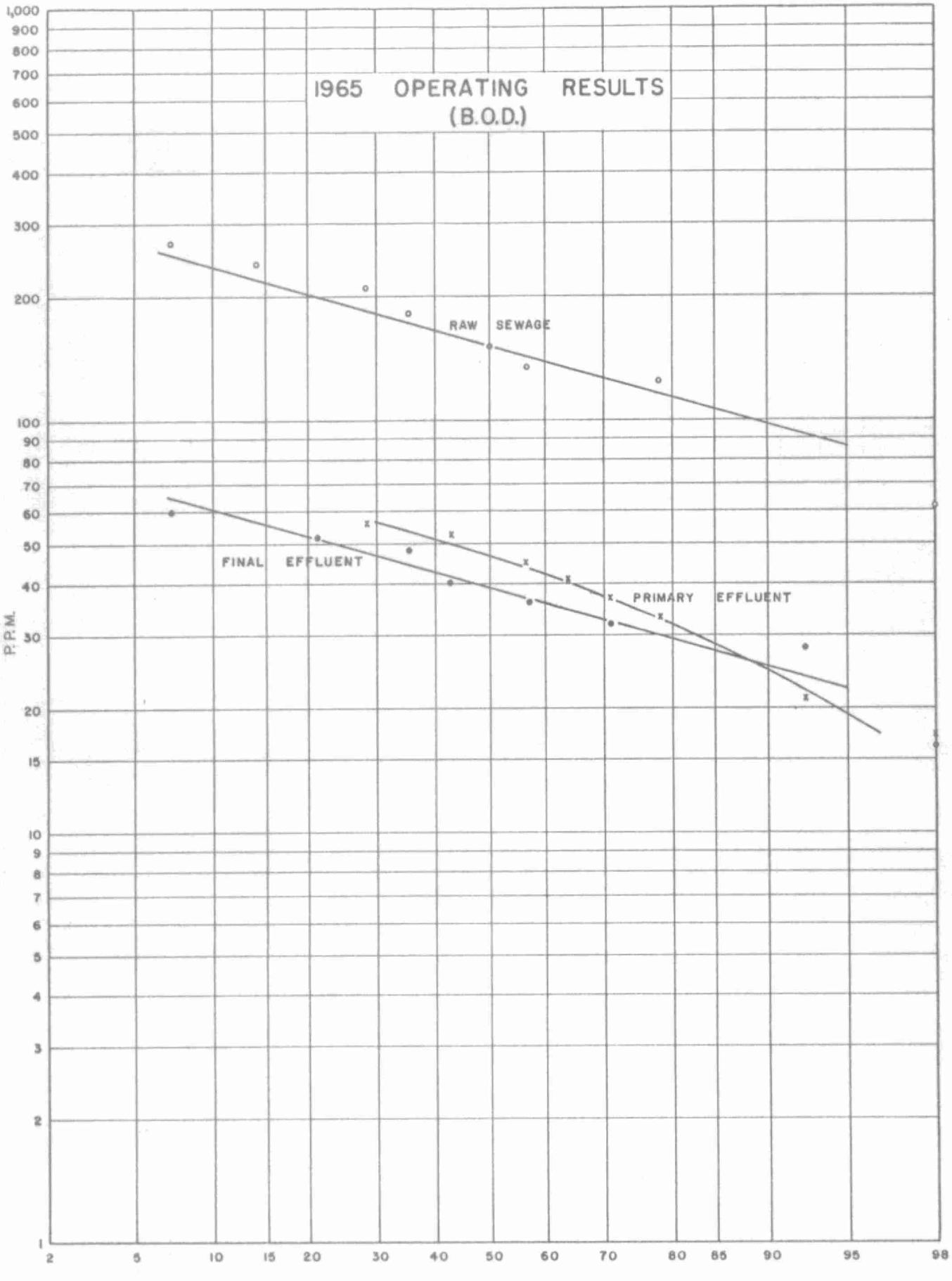


FRANKFORD WATER SUPPLY SYSTEM

FLOW CHART

Process Data -- WATER POLLUTION CONTROL PLANT




1965 OPERATING RESULTS
(B.O.D.)
RAW SEWAGE
FINAL EFFLUENT
PRIMARY EFFLUENT
P.P.M.
1,000
900
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700
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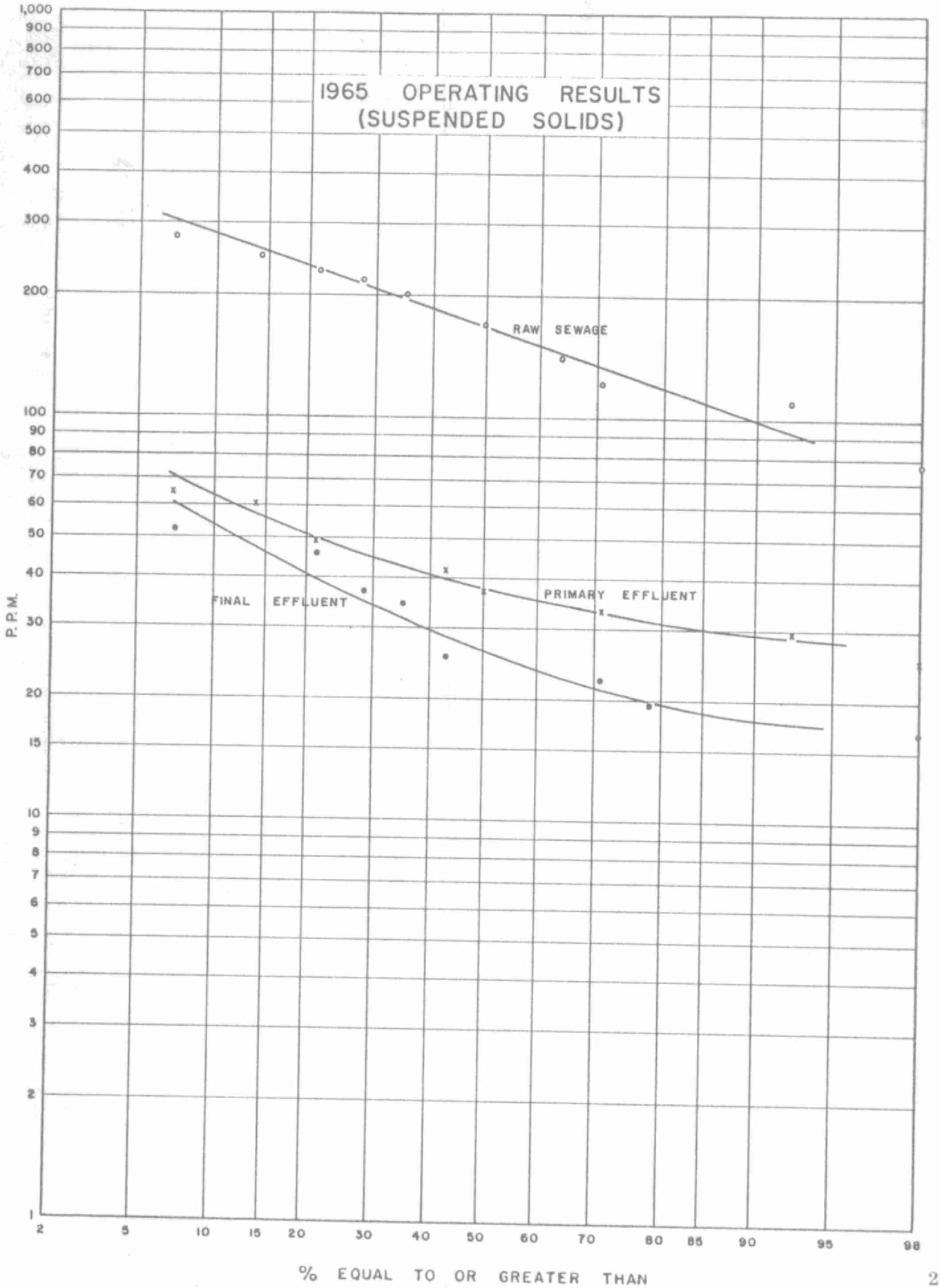
% EQUAL TO OR GREATER THAN


1965 OPERATING RESULTS
(SUSPENDED SOLIDS)
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
P. P. M.
% EQUAL TO OR GREATER THAN
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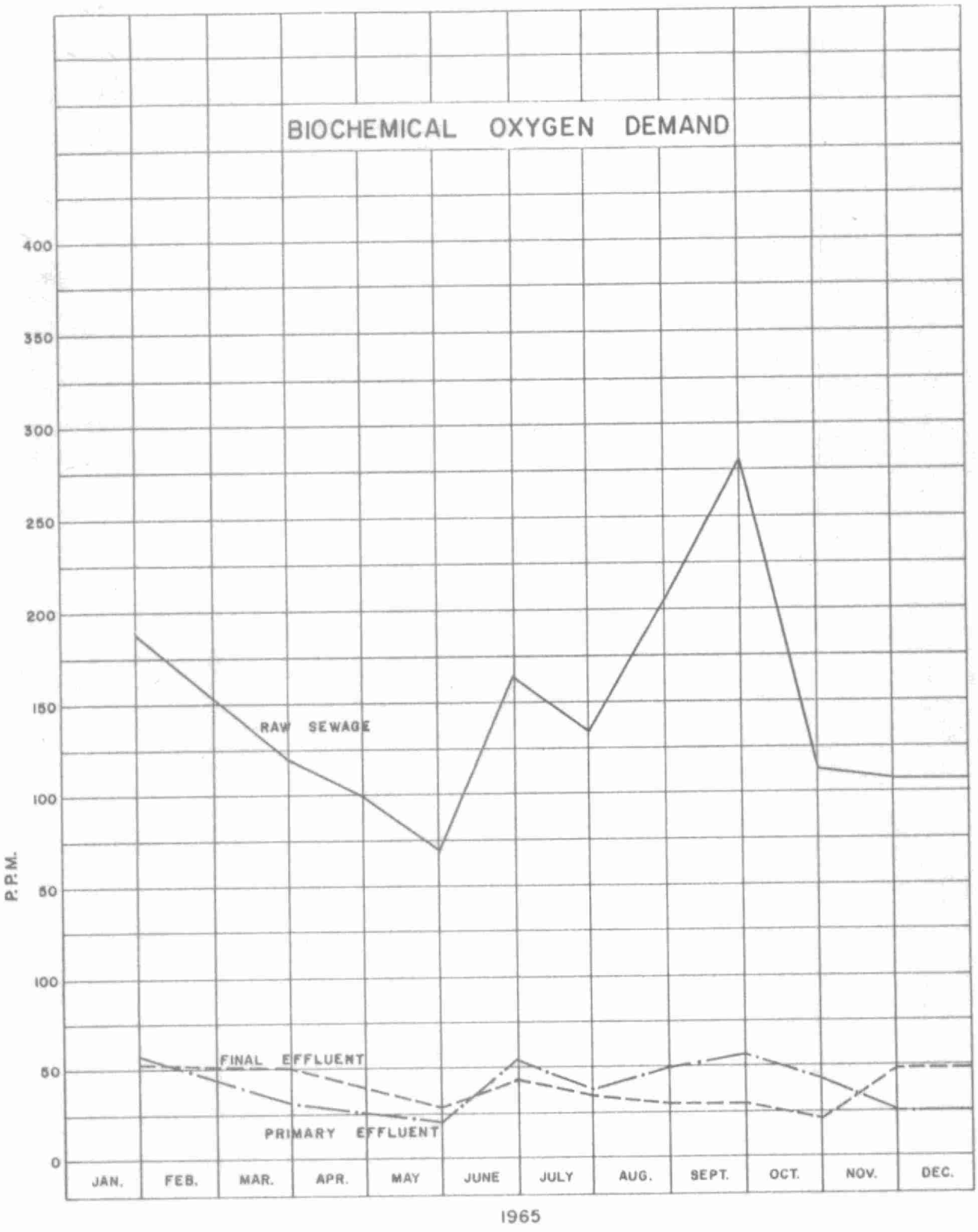
BIOCHEMICAL OXYGEN DEMAND
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250
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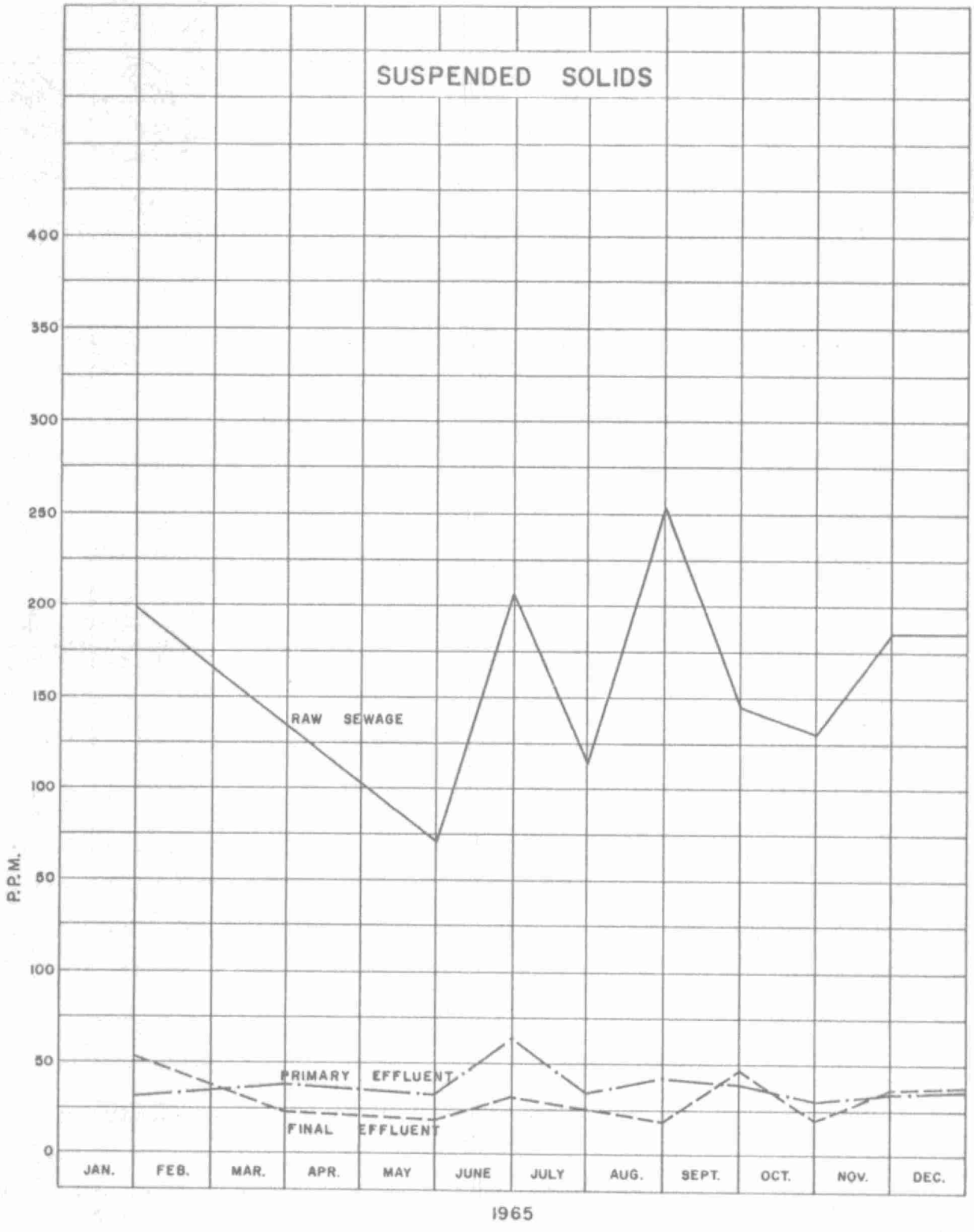
P.P.M.
RAW SEWAGE
FINAL EFFLUENT
PRIMARY EFFLUENT
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
1965


SUSPENDED SOLIDS
400
350
300
250
200
150
100
50
100
50
0
P.P.M.
RAW SEWAGE
PRIMARY EFFLUENT
FINAL EFFLUENT
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
1965

GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	190	53	72.0	1.9	199	53	73.5	2.0	4
FEB.	*157	38	75.5	2.8	*160	31	80.5	3.0	4
MAR.	122	50	59.0	1.7	137	22	84.0	2.7	4
APR.	*157	38	75.5	3.5	*160	31	80.5	3.8	5
MAY	70	28	60.0	1.2	71	18	74.5	1.5	4
JUNE	166	44	73.5	3.3	208	36	82.5	4.7	4
JULY	135	35	74.0	2.8	116	26	77.5	2.5	5
AUG.	230	31	86.5	5.6	255	18	93.0	6.6	5
SEPT.	280	31	89.0	6.8	144	48	66.5	2.6	5
OCT.	113	22	80.5	3.6	128	20	84.5	4.3	4
NOV.	108	49	54.5	2.3	185	36	80.5	5.9	4
DEC.	*157	38	75.5	3.7	*160	31	80.5	4.0	5
TOTAL	-	-	-	39.2	-	-	-	43.6	53
AVG.	157	38	75.5	3.3	160	31	80.5	3.6	4

* Average values substituted, No samples taken.
** During recirculation period loadings calculated on prorated daily flow of 0.181 mgd.

COMMENTS

The average BOD or raw sewage directed to the plant was 157 ppm and the average BOD of treated sewage was 38 ppm, a 75.5 percent reduction.

The influent sewage had an average SS concentration of 160 ppm and the effluent had an average concentration of 31 ppm or 80.5 percent reduction.

There was a total of 39.2 tons of BOD removed and 43.6 tons of SS removed by the plant process during the year. A total of 53 cubic feet of grit was removed from the grit chamber.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (P.P.M)
JANUARY	2.750	180	6.54
FEBRUARY	4.682	166	3.54
MARCH	4.768	183	3.84
APRIL	5.960	178	2.99
MAY	* 2.808	*125 187	4.45
JUNE	-	162	-
JULY	-	149	-
AUGUST	-	152	-
SEPTEMBER	** 1.490	**38 150	2.55
OCTOBER	7.978	155	1.94
NOVEMBER	7.945	158	1.99
DECEMBER	6.221	155	2.49
TOTAL	-	1975	-
AVERAGE	5.758	164	3.00

* To May 21st. Recirculation commenced.
** From September 23rd. Recirculation discontinued

COMMENTS

Flows recorded during the summer months of the year do not indicate total flows to the plant as the recirculation flows from the trickling filter are also included. Thus the chlorine dosage rates for the summer period are not included in the table.

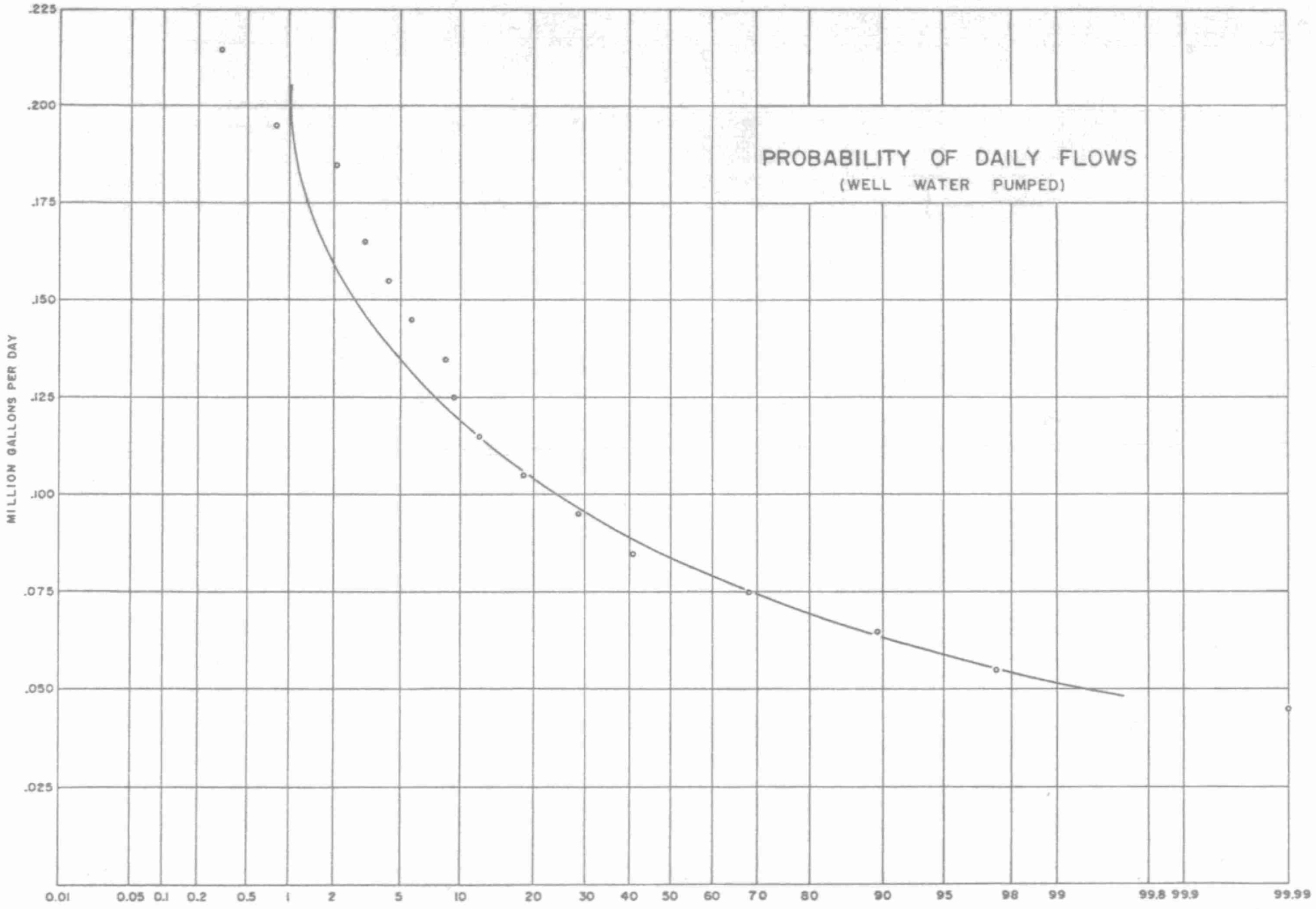
Process Data -- WATER SUPPLY SYSTEM

PROBABILITY OF FLOWS

From the probability of flow curve it can be seen that only one percent of the time the flows were equal to or greater than 0.216 mgd. The average daily flow was 0.084 mgd.

MONTHLY AVERAGE DAILY FLOW

The highest average daily flows were recorded in June at 0.137 mgd and the lowest in April at 0.060 mgd. The high demand for water in the summer is due to lawn watering.


PROBABILITY OF DAILY FLOWS
(WELL WATER PUMPED)
MILLION GALLONS PER DAY
.225
.200
.175
.150
.125
.100
.075
.050
.025
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
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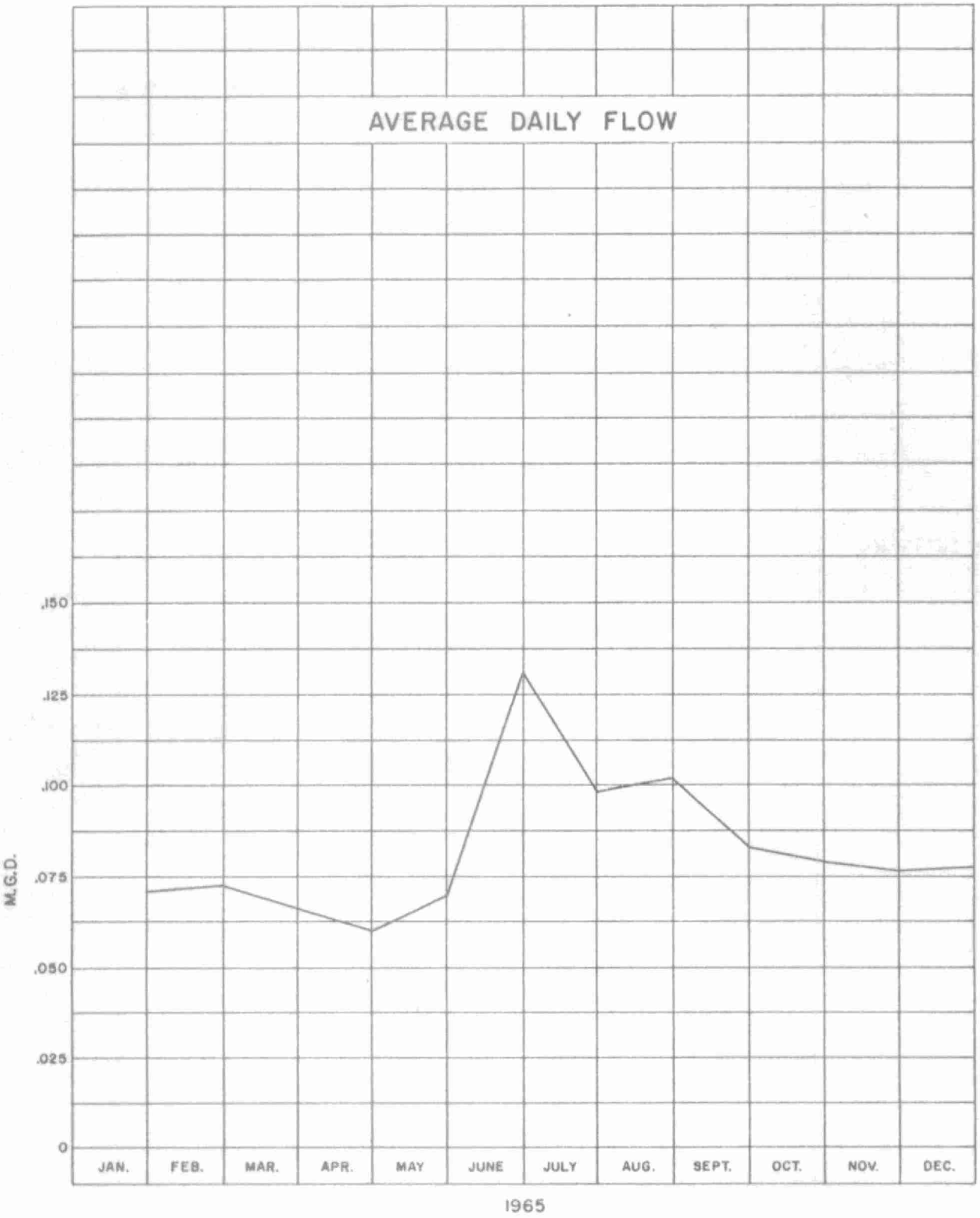
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN


AVERAGE DAILY FLOW
M.G.D.
.150
.125
.100
.075
.050
.025
0
JAN.
FEB.
MAR.
APR.
MAY
JUNE
JULY
AUG.
SEPT.
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1965

MONTHLY FLOWS			
January	2.200	July	3.042
February	2.059	August	3.171
March	2.074	September	2.490
April	1.805	October	2.442
May	2.579	November	2.308
June	3.916	December	2.409
Total		30.495	
Average		2.541	

COMMENTS

The total quantity of well water pumped to the distribution system in 1965 was 30.495 mg. The monthly average was 2.541 mg.


ONTARIO WATER RESOURCES COMMISSION